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Seasonal abundance of spider mite *Tetranychus urticae* Koch on vegetable and ornamental plants in Rajshahi

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Abstract: The seasonal abundance of spider mite *T. urticae* on twenty vegetable and twenty four ornamental plants in Rajshahi was conducted during August 2010 to January 2011. The mite was present on joscpks coat, kathua, lady's finger, cucumber, brinjal, tomato, bottle gourd, bean, loofah, spinach, bitter melon, pointed gourd, radish, and cowpea but no mite was recorded on other six plants. But all the ornamental plants bagan-bilash, bottlebrush, nayantara, morog-jhuti, hasnahena, chandramallika, dalia, krisno-chura, togor, joba, madhobilata, rongon, beli, daisy, sondhamaloti, kamini, musanda, rakto-karobi, shewli, kath-golap, rajanigandha, golap, ganda, zinia contained mites. The pick population was prevailed during August. The increase of mite number is directly related with the increase of temperature.

Introduction

Mites have a worldwide distribution and causes serious damage to livestock, agricultural crops, ornamental plants and stored products. They also bring sickness and death to man; or they may be parasites, predators or saprophytes destroying animals, plants, or their products and adversely affecting man or his possessions (Johnson and Layon, 1991). Particularly two spotted spider mite has been reported to attack about 1200 species of plant (Zhang, 2003), of which more than 150 are economically important (Jeppson *et al*., 1997; Xie *et al.,* 2006), such as vegetables and ornamental plants, including corn, cotton, cucumber, beans, tomato, eggplant, peppers and rose (Helle and Sabelis, 1985a,b; Navajas, 1998; Aucejo *et al.,* 2003). It is common in green house where it is an important pest of vegetables, fruits, cut flowers and ornamental plants (Johnson and Lyon, 1991).

Several works have yet been done on mite pests all over the world. A few works have also been done in Bangladesh among which, Biswas *et al.,* 2004; Haque *et al.*, 2004, 2006, 2007; Haque, 2006, 2008; Naher *et al.*, 2005, 2006,2008; Parvin and Haque, 2008; Islam *et al.,* 2008 are important. However, there are limited number of reports of this mite on common vegetable and ornamental plants. The attempts were made to explore the presence and status of this mite on few common vegetable and ornamental plants in Rajshahi region.

Materials and methods

For the exploration of two spotted spider mites, twenty common vegetable and twenty four ornamental plants in Rajshahi City Corporation area were selected. The vegetable plants were Indian spinach (*Basella alba*), joscpks coat (*Amaranthus gangetica*), drumstick tree (*Moringa concanensis*), kathua (*Amaranthus* sp.), pointed gourd (*Trichosanthes dioica*), sessile joyweed (*Alternanthera sessili*), swamp cabbage (*Ipomoea aquatica*), lady's finger (*Ablemoscus esculentus*), cucumber (*Cucumis sativus*), brinjal (*Solanum melongena*), tomato (*Lycopersicon lycopersicum*), bitter melon (*Monordica charantia*), bottle gourd (*Lagenaria vulgaris*), spinach (*Spinacia oleracea*), spiny amaranth (*Amaranthus spinosus*), bean (*Lablab purpureus*), cowpea (*Vigna sinensis*), angled loofah (*Luffa acutangula*), radish (*Raphanus sativus*), coco-yam (*Colocasia esculenta*) and ornamental plants were bagan-bilash (*Bougainvillea spectabilis*), bottlebrush (*Callistemon*), nayantara (*Catharanthus roseus*), morog-jhuti (*Celosia cristata*), hasnahena (*Cestrum nocturnum*), chandramallika (*Chrysanthemum*), dalia (*Dahlia*), krisno-chura (*Delonex regia*), togor (*Ervatamia divaricata*), joba (*Hibiscus rosa-sinensis*), madhobilata (*Hiptage benghalensis*), rongon (*Ixora coccinea*), beli (*Jasminum sambac*), daisy (*Leucanthemum vulgare*), sondhamaloti (*Mirabilis jalap*), kamini (*Murraya paniculata*), musanda (*Mussaenda*), rakto-karobi (*Nerium oleander*), shewli (*Nyctanthes arbortristis*), kath-golap (*Plumeria*), rajanigandha (*Polianthes tuberose*), golap (*Rosa sp.*), ganda (*Tagetes erecta*) and zinia (*Zinnia elegans*).

In order to observe the abundance of two spotted spider mites on the vegetables and ornamental plants four places (Choddopaya, Binodpur Bazar, Meherchondi and Budhpara) in Rajshahi City Corporation were selected and the samples were collected from the selected plants during four/five days in a week. During each sampling leaves *viz.* old, mature and young were collected from five vegetable and five ornamental plants. Altogether, six leaves (2 old, 2 mature, 2 young) were taken from each plant. Sampling was done during August 2010 to January 2011. The leaves were

collected randomly and carried to the laboratory using separate polythene bags. The total number of mites on the leaves were counted with the aid of sterieo-binocular microscope by applying counting and removing technique i.e., counted mites were removed by a camel hair brush. Daily field temperature, relative humidity and rainfall were recorded during the study period.

Results and Discussion

Nine vegetable plants *viz*. joscpks coat, kathua, lady's finger, cucumber, brinjal, tomato, bottle gourd, bean and loofah contained the highest number of mite per leaf during August (Table 1). The remaining of vegetable plant spinach had the highest population in October, cowpea in November, pointed gourd and radish in December and bitter melon in January respectively.

Table 1. Average number of spider mite on leaves on different vegetable and ornamental plants during August 2010 to January 2011.

Host plants	Mite number per leaf					
	August 2010	September 2010	October 2010	November 2010	December 2010	January 2011
Indian spinach	-	-	-	-	-	-
Joscpks coat	15.11±0.90	10.67±1.27	7.92±0.52	6.83±0.42	4.67±0.58	4.75±0.45
Drumstick tree	-	-	-	-	-	-
Kathua	16.72±0.31	10.42±0.31	10.67±1.32	5.67±0.67	3.67±0.51	3.95±0.90
Pointed gourd	18.00±1.34	14.54±2.04	17.38±3.50	18.56±1.79	19.79±2.30	13.09±1.88
Sessile joyweed	-	-	-	-	-	-
Swamp cabbage	-	-	-	-	-	-
Lady's finger	16.44±1.29	13.08±0.92	10.50±0.82	9.06±0.96	5.93±0.44	4.38±0.66
Cucumber	20.50±1.67	14.72±1.79	10.58±0.31	8.61±0.36	5.63±0.60	5.11±0.49
Brinjal	22.09±0.09	14.20±0.96	12.63±0.61	10.61±0.11	7.88±0.78	4.79±0.66
Tomato	13.92±0.25	11.17±1.01	9.33±1.08	6.89±0.62	7.21±0.93	4.88±0.27
Bitter melon	1.09 ±1.09	0.58±0.25	4.67 ±0.89	4.39±1.00	5.33 ±0.10	5.78 ±2.04
Bottle gourd	32.50±1.00	22.78±2.41	15.28±0.31	20.67±2.06	17.33±2.15	10.45±0.93
Spinach	0.75±0.75	0.06±0.06	8.72±4.08	0.39±0.39	3.58±0.85	1.33±0.59
Spiny amaranth	-	-	-	-	-	-
Bean	25.42±2.42	19.38±1.43	13.92±0.90	10.39±0.82	9.17±0.85	6.13±0.49
Cowpea	11.50±6.69	4.00±0.62	8.50±0.87	17.67±1.80	14.78±4.40	8.22±0.59
Angled loofah	22.50±0.86	13.83±0.71	10.84±2.17	9.00±1.40	8.39±0.58	7.83±0.29
Radish	-	0.00±0.00	1.04±0.40	5.67±1.25	12.13±1.31	7.71±2.69
Coco-yam	-	-	-	-	-	-
Bagan-bilash	0.415±0.25	0.39±0.056	0.66±0.24	0.91±0.08	0.627±0.02	0.66±0.24
Bottlebrush	0.58±0.08	0.67±0.00	0.37±0.14	0.67±0.33	0.33±0.17	0.83±0.12
Nayantara	1.50±0.35	0.83±0.49	0.82±0.09	1.17±0.00	1.17±0.00	0.50±0.28
Morog-jhuti	0.22±0.14	0.67±0.00	0.67±0.00	0.00±0.00	0.71±0.00	0.67±0.06
Hasnahena	0.50±0.09	0.78±0.10	0.89±0.14	0.67±0.29	0.75±0.08	0.59±
Chandramallika	0.46±0.08	0.78±0.54	0.75±0.26	0.58±0.24	0.58±0.04	0.78±0.05
Dalia	0.27±0.27	1.17±0.00	1.00±0.09	1.11±0.15	0.89±0.19	0.25±0.14
Krisno-chura	0.14±0.42	0.00±0.00	0.00±0.00	0.05±0.05	0.00±0.00	0.1±0.17
Togor	1.38±0.52	0.95±0.14	2.00±0.14	0.46±0.17	0.88±0.24	0.62±0.18
Joba	0.79±0.45	0.94±0.19	1.16±0.09	1.39±0.10	1.12±0.23	0.66±0.25
Madhobilata	0.50±0.49	1.11±0.14	0.77±0.14	0.83±0.16	1.16±0.14	0.66±0.09
Rongon	0.75±0.07	1.00±0.09	1.33±0.09	0.91±0.08	0.62±0.20	0.55±0.29
Beli	1.10±0.39	1.44±0.69	0.72±0.14	0.33±0.16	1.15±0.18	0.50±0.00
Daisy	1.00±0.32	0.25±0.20	0.54±0.04	0.33±0.00	0.66±0.16	0.45±0.26
Sondhamaloti	0.77±0.05	0.83±0.33	0.83±0.00	0.83±0.00	0.66±0.16	0.83±0.00
Kamini	0.83±0.09	0.50±0.00	0.83±0.09	0.71±0.14	0.94±0.05	0.44±0.14
Musanda	2.11±0.24	1.22±0.10	1.63±0.15	1.58±0.08	1.17±0.28	0.58±0.41
Rakto-karobi	1.17±0.44	1.00±0.16	0.72±0.14	0.99±0.16	1.16±0.09	0.50±0.00
Shewli	0.71±0.35	0.94±0.10	0.95±0.04	0.00±0.00	0.83±0.09	0.47±0.33
Kath-golap	1.00±0.16	1.61±0.14	1.67±0.00	1.33±0.16	1.27±0.`0	1.25±0.57
Rajanigandha	1.33±0.66	0.70±0.20	0.24±0.16	0.66±0.16	0.66±0.06	0.25±0.24
Golap	0.83±0.23	1.33±0.69	0.44±0.21	0.61±0.05	0.58±0.05	0.61±0.05
Ganda	0.58±0.08	0.45±0.14	0.45±0.17	0.39±0.11	0.16±0.00	0.41±0.13
Zinia	0.08±0.07	0.55±0.05	0.61±0.05	0.69±0.16	0.83±0.06	0.83±0.33

In case of ornamental plants nayantara, krisno-chura, daisy, musanda, rakto-karobi, rajanigandha, ganda, had the highest number of mite during August; chandramallika, dalia, beli, sondhamaloti, golap in September; hasnahena, togor, rongon, shewli, kath-golap in October;

bagan-bilash and joba in November; morog-jhuti, madhobilata, kamini, zinia, in December and bottlebrush in January respectively. The ornamental plants contained the lower number of mite in comparison to vegetable plants.

The impacts of environmental factors on mite population on different types of vegetables and ornamental plants were studied and the calculated 'r' values are presented in Table 2. In vegetable plants temperature had direct positive impact on mite population on joscpks coat, kathua, lady's finger, cucumber, brinjal, tomato, bottle gourd, bean, angled loofah, rongon, daisy, musand and negative impact on bitter melon, radish, morog-jhuti and zinnia. In case of brinjal and sondhamaloti mite number increased significantly with the increase of relative humidity but on radish mite number decreased significantly with the increase of relative humidity.

Table 2: The values of coefficient of co-relation (r) between mite number and different environment factors.

Vegetable plants				Ornamental plants			
Host plant	r values with			Host plant	r values with		
	Temp (ºC)	Rh (%)	RF (mm)		Temp (ºC)	Rh (%)	RF (mm)
Indian spinach	-	-	-	Bagan-bilash	-0.12	-0.15	0.30
Joscpks coat	0.82***	0.27	-0.02	Bottlebrush	-0.17	-0.08	0.19
Drumstick tree	-	-	-	Nayantara	0.36	-0.06	-0.02
Kathua	0.78***	0.27	0.27	Morog-jhuti	-0.54*	0.15	-0.38
Pointed gourd	0.13	-0.27	0.13	Hasnahena	-0.07	-0.09	0.08
Sessile joyweed	-	-	-	Chandramallika	-0.21	-0.39	-0.10
Swamp cabbage	-	-	-	Dalia	0.28	0.26	-0.30
Lady's finger	0.90***	0.36	0.22	Krisno-chura	0.06	-0.07	-0.20
Cucumber	0.83***	-0.04	0.53*	Togor	0.12	0.14	-0.09
Brinjal	0.85***	0.53**	0.23	Joba	-0.00	0.29	-0.21
Tomato	0.78***	0.28	0.10	Madhobilata	-0.06	0.12	-0.05
Bitter melon	-0.60*	-0.28	-0.39	Rongon	0.57*	0.25	0.38
Bottle gourd	0.61**	0.46	0.49*	Beli	0.15	-0.27	-0.05
Spinach	0.13	0.18	0.24	Daisy	0.42*	0.13	0.41
Spiny amaranth	-	-	-	Sondhamaloti	0.11	0.61*	-0.20
Bean	0.86***	0.29	0.53**	Kamini	0.06	-0.15	0.00
Cowpea	-0.17	0.11	-0.29	Musanda	0.59*	0.18	-0.04
Angled loofah	0.71***	0.22	0.15	Rakto-karobi	0.38	0.20	-0.10
Radish	-0.56*	-0.58*	-0.14	Shewli	0.28	0.28	-0.24
Coco-yam	-	-	-	Kath-golap	0.19	0.15	0.20
				Rajanigandha	0.38	-0.21	0.16
				Golap	0.37	-0.30	-0.27
				Ganda	0.15	-0.13	-0.28
				Zinia	-0.47*	0.06	-0.10

* = P<0.05, ** = P<0.01, *** = P<0.001

In case of ornamental plants mite population significantly increased with the increase of temperature on rongon, daisy and musanda but decrease with the increase of temperature on morog-jhuti and zinia. The relative humidity was found to affect the mite populations only on sondhamaloti. Temperature has been the most extensively studied of all weather factors that bear on mite population and it appears to have the most over all influence. Low temperature can cause reductions in winter populations. High mortality also occurs when unseasonably low temperature follows worm weather in early spring.

Gotoh (1997) studied the population of *T. urticae* in four different Japanese pear orchards in Ibaraki prefecture and found the seasonal prevalence's of mite populations then similar, but their abundances varied greatly. He observed two types of seasonal population trends in *T. urticae*. In one pear orchard there was a population peak from September to early October and in the other there were two peaks in July and September.

Nahar (2005) made extensive survey and recorded higher number of *T. urticae* in April and August. The preferred temperature for the rapid development of *T. urticae* is 25 to 27° C (Jeppson *et al.,* 1975). The impact of temperature on the mite population shows the positive significant effect on most of the vegetable plants. In case of the host *M. charanta* (bitter melon) and *R. saativus* (radish) the temperature exerted the negative impact on mite number. As these are winter crops and plants did not develop sufficiently due to hot temperature not fit to supply the food for the pest animal, the population reduced due to rise of temperature.

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